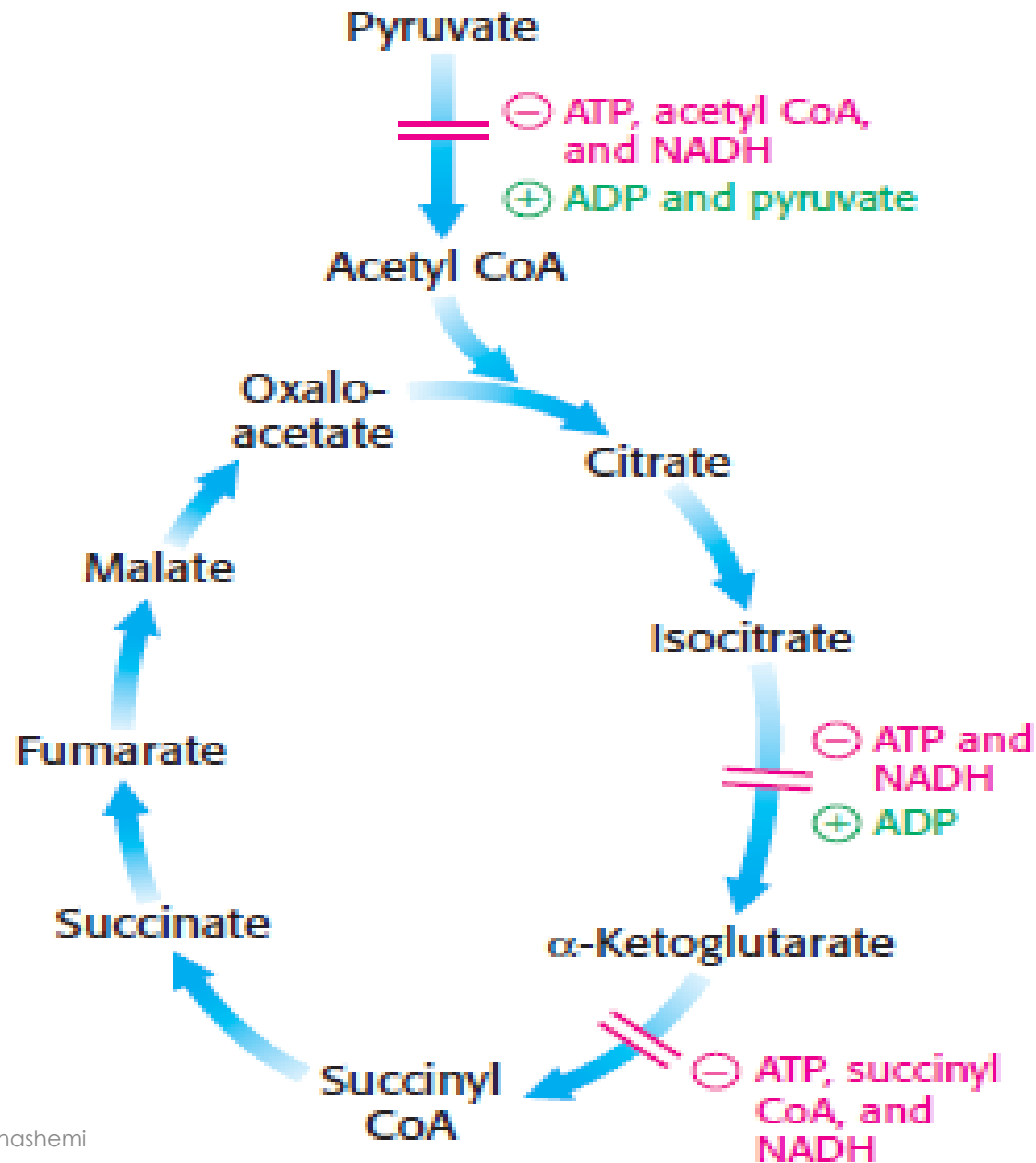
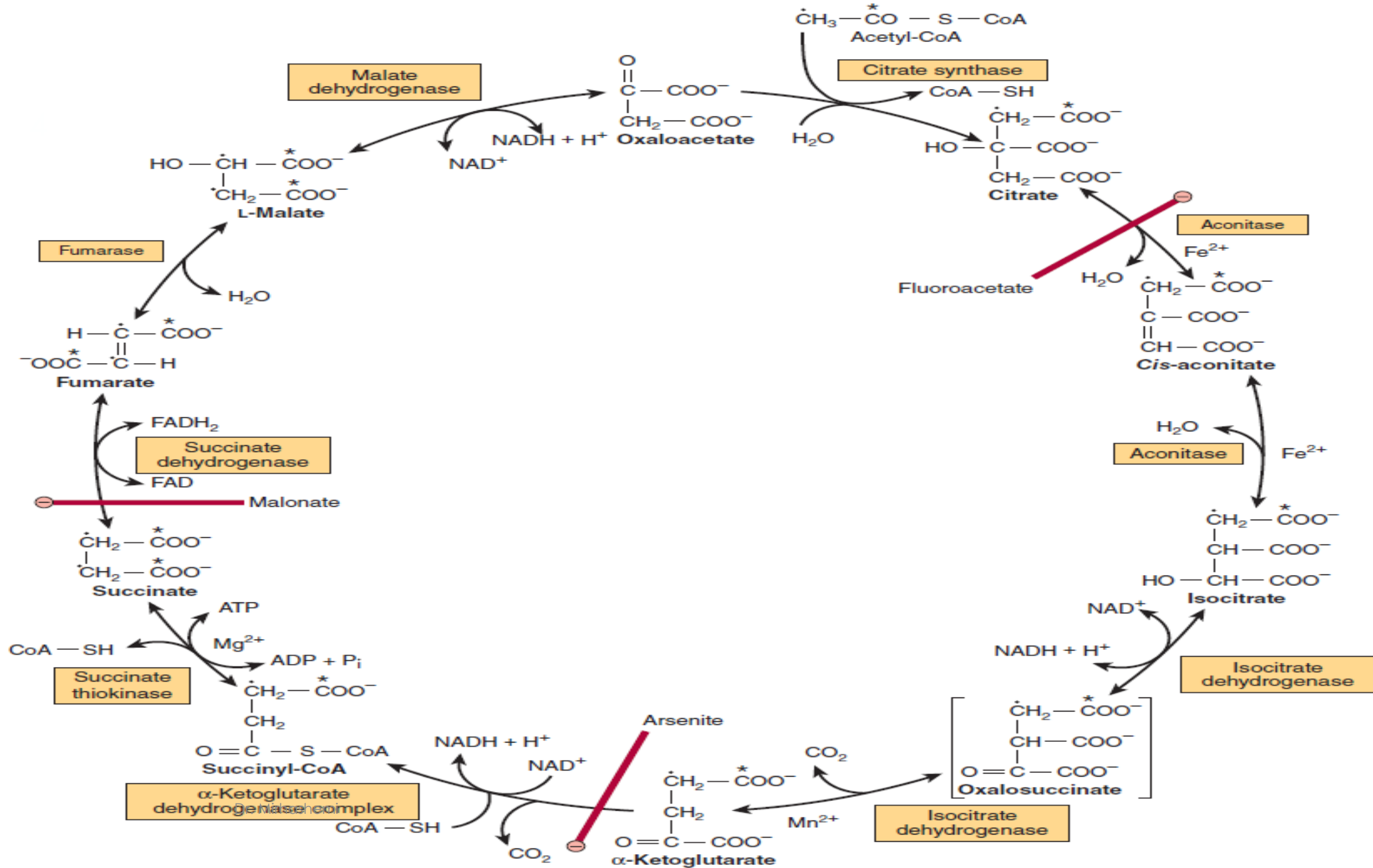




Dr. Mirhashemi

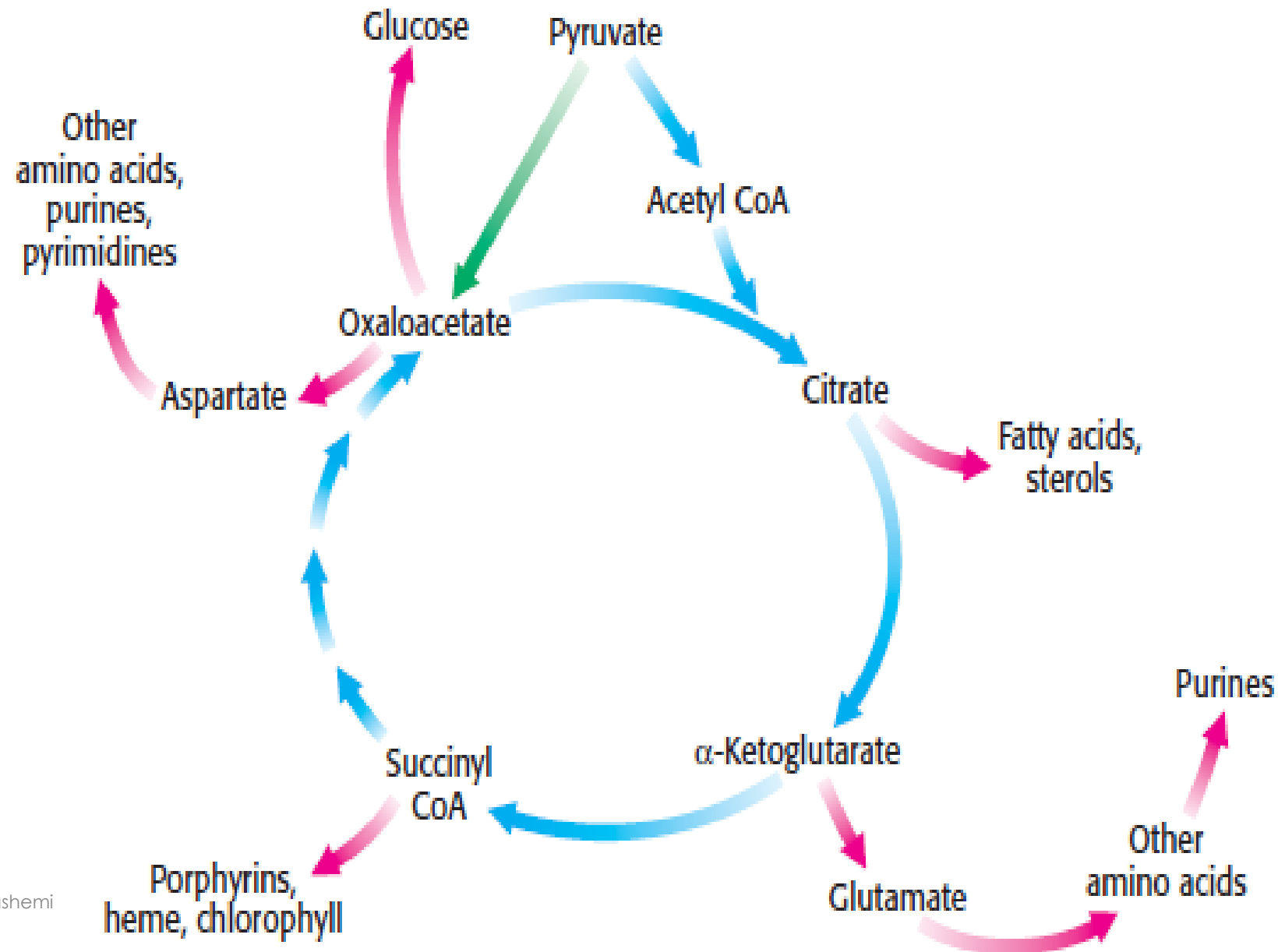
Citric acid cycle





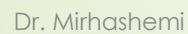
Biosynthetic roles of The citric acid cycle

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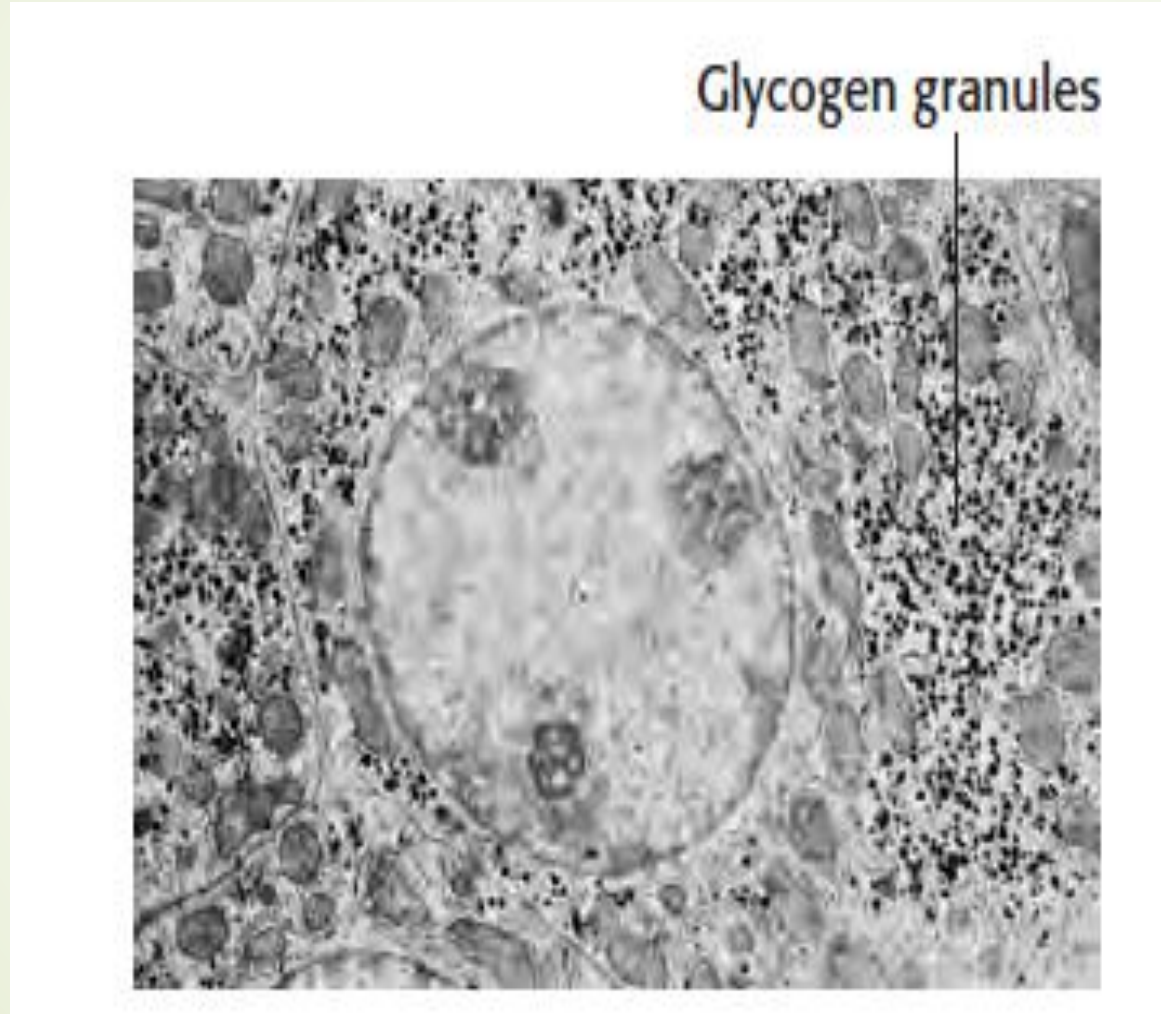


Metabolism of Glycogen

- Describe the synthesis and breakdown of glycogen and how the processes are regulated in response to hormone action.
- Describe the various types of glycogen storage diseases



Electron micrograph of a liver cell



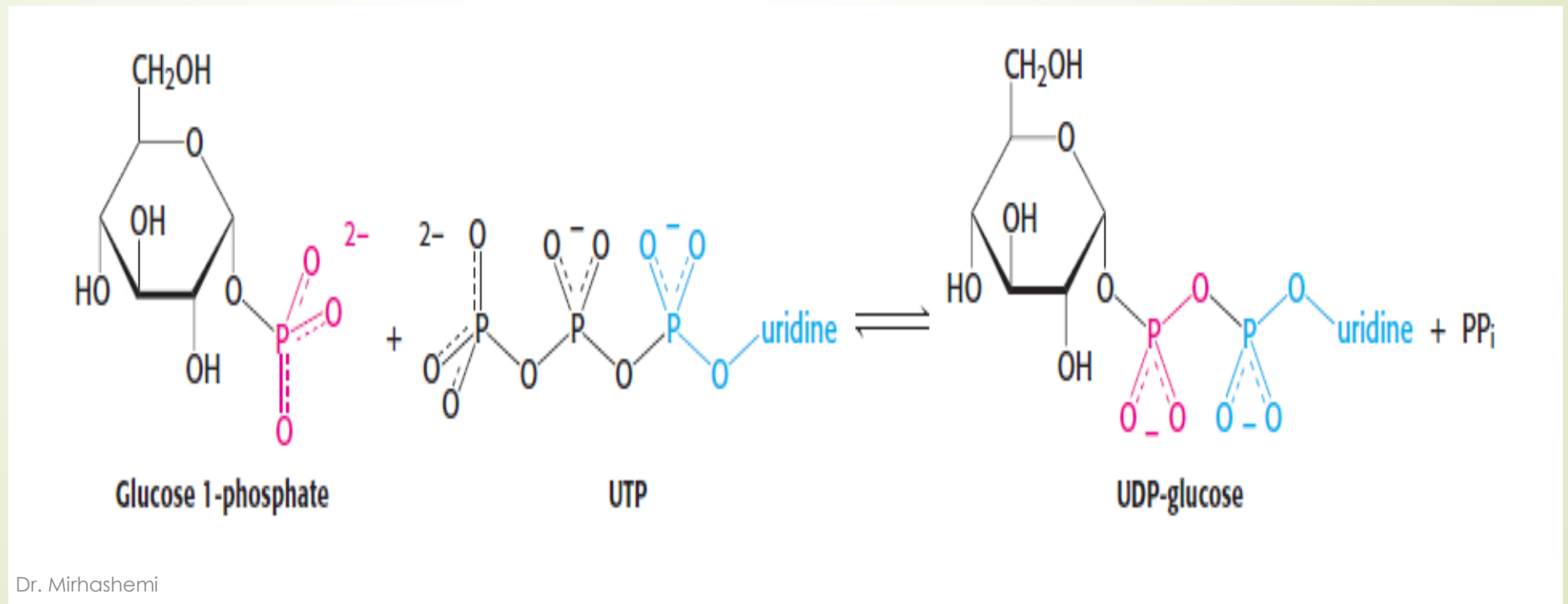
Glycogen Is Synthesized and Degraded by Different Pathways

Synthesis: $\text{Glycogen}_n + \text{UDP-glucose} \longrightarrow \text{glycogen}_{n+1} + \text{UDP}$

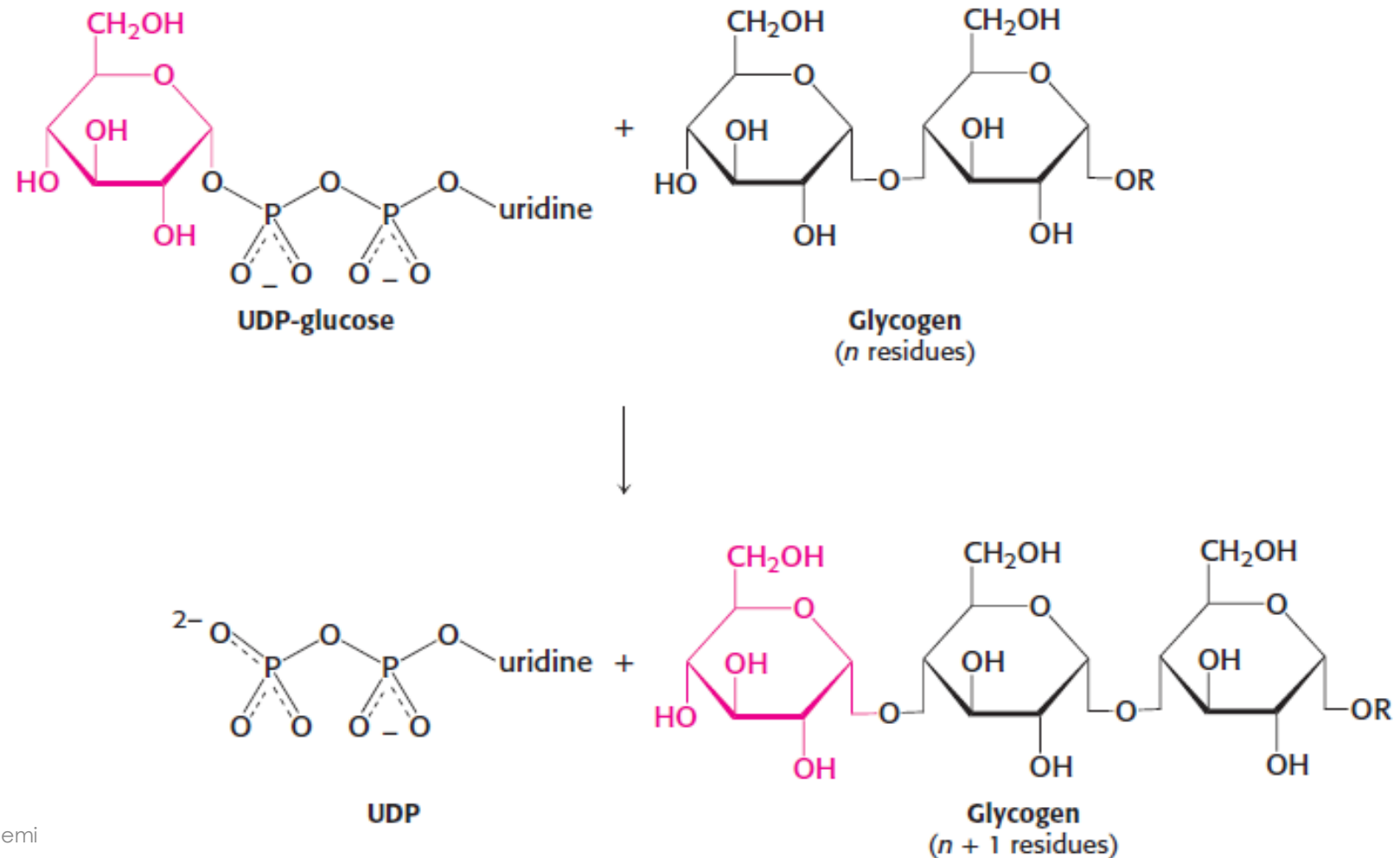
Degradation: $\text{Glycogen}_{n+1} + \text{P}_i \longrightarrow \text{glycogen}_n + \text{glucose 1-phosphate}$

UDP-glucose is an activated form of glucose

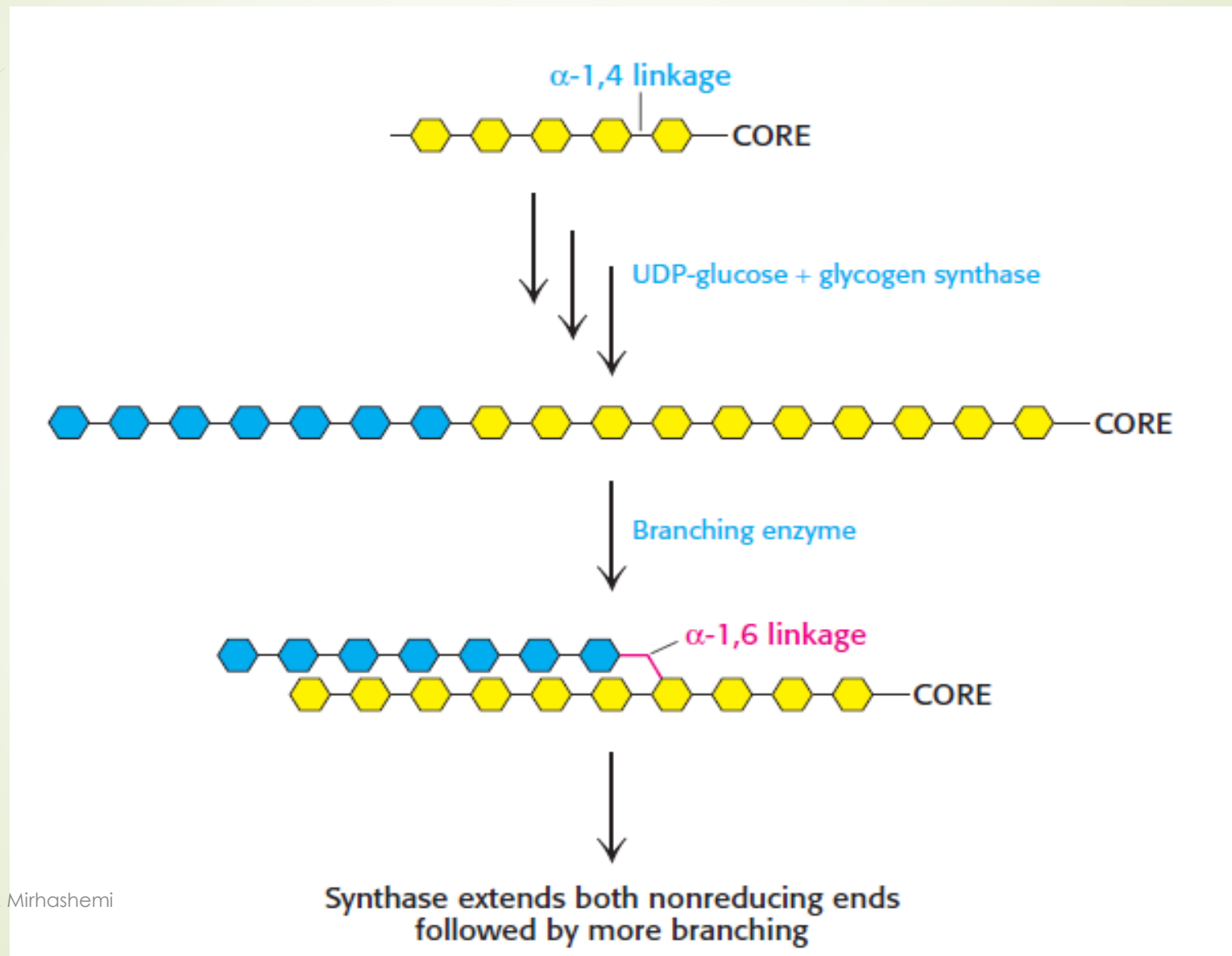
- ➔ UDP-glucose is synthesized from **glucose 1-phosphate** and **uridine triphosphate (UTP)** in a reaction catalyzed by **UDP-glucose pyrophosphorylase**.



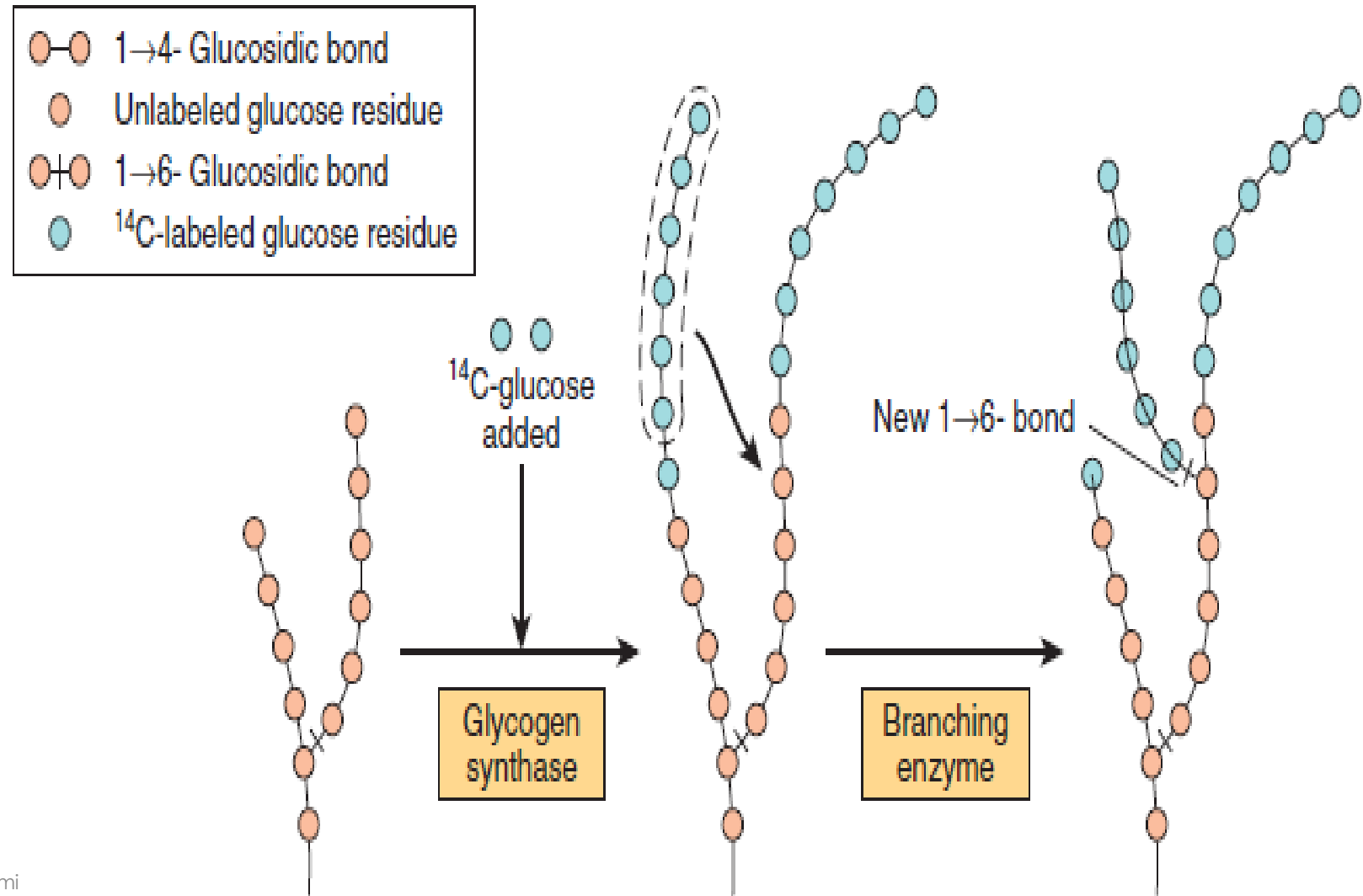
Glycogen synthase catalyzes the transfer of glucose from UDP-glucose to a growing chain.



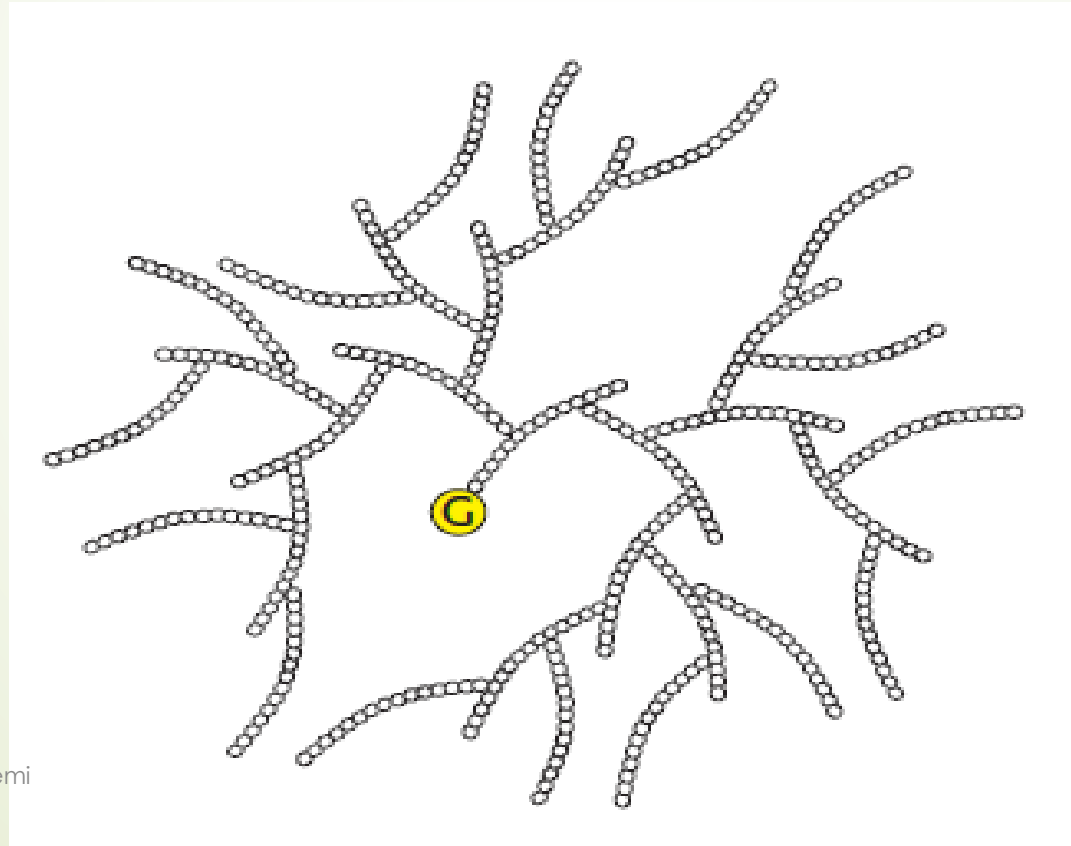
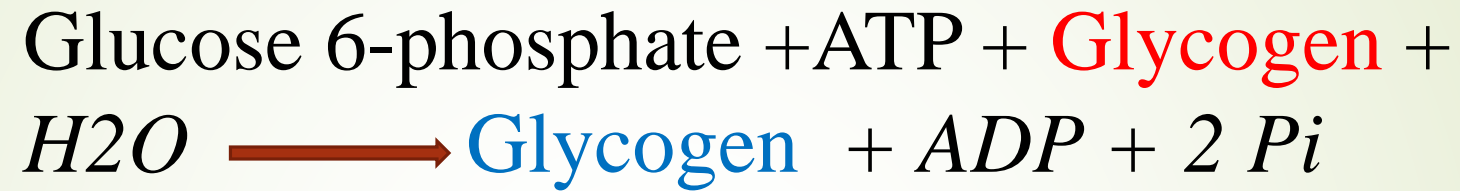
A branching enzyme forms α -1,6 linkages



The biosynthesis of glycogen

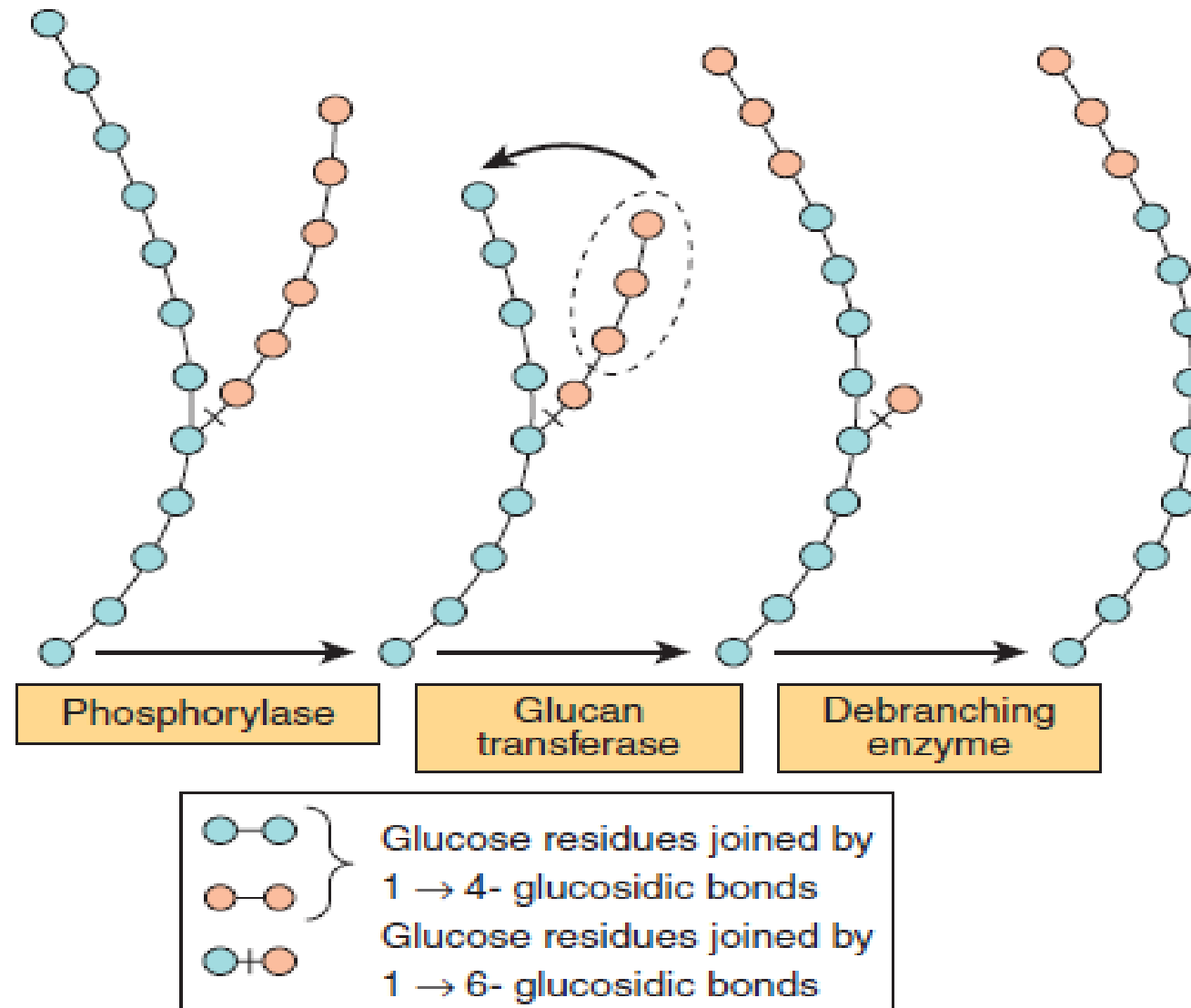


Cross section of a glycogen molecule



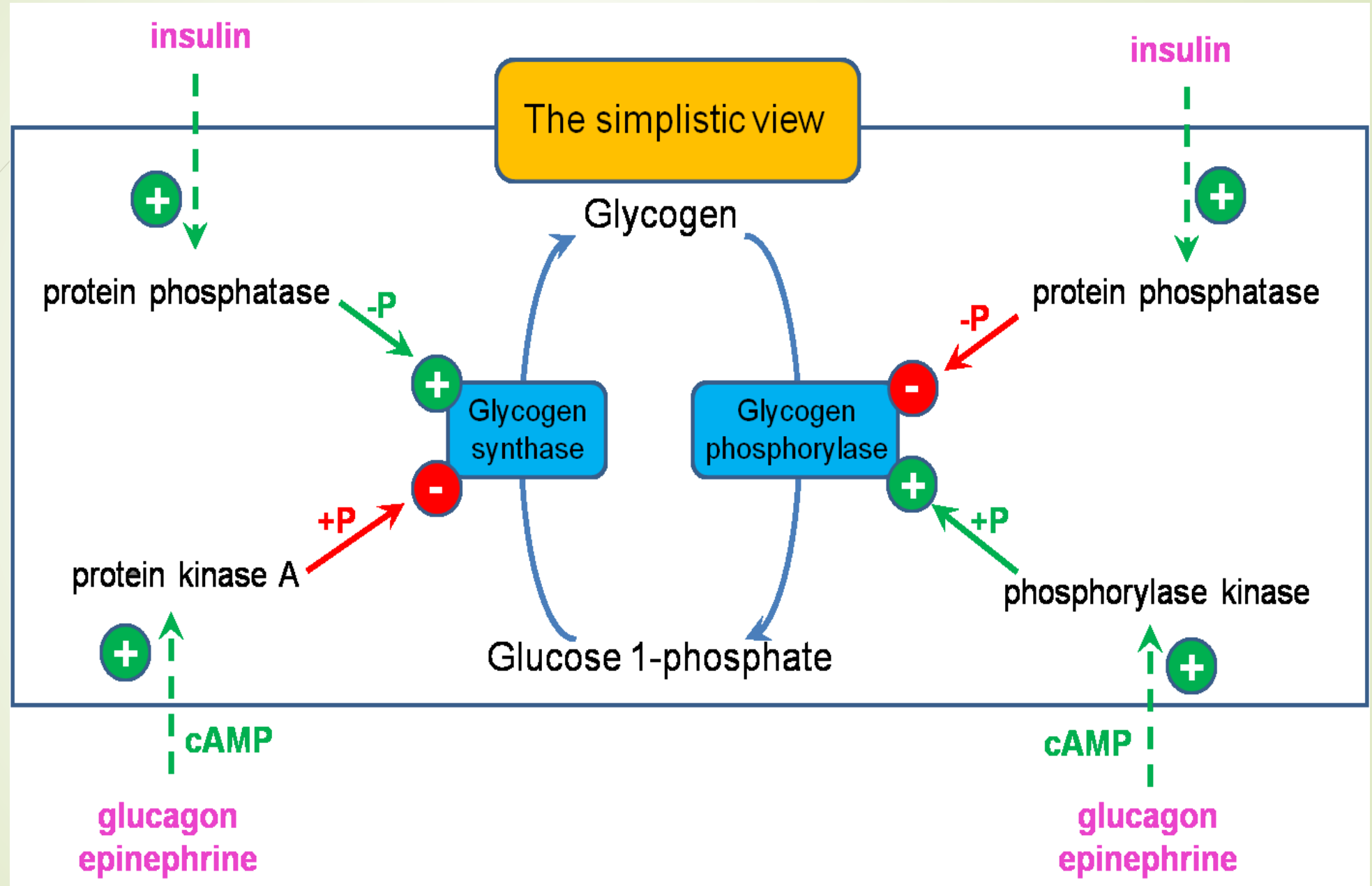
Steps in glycogenolysis

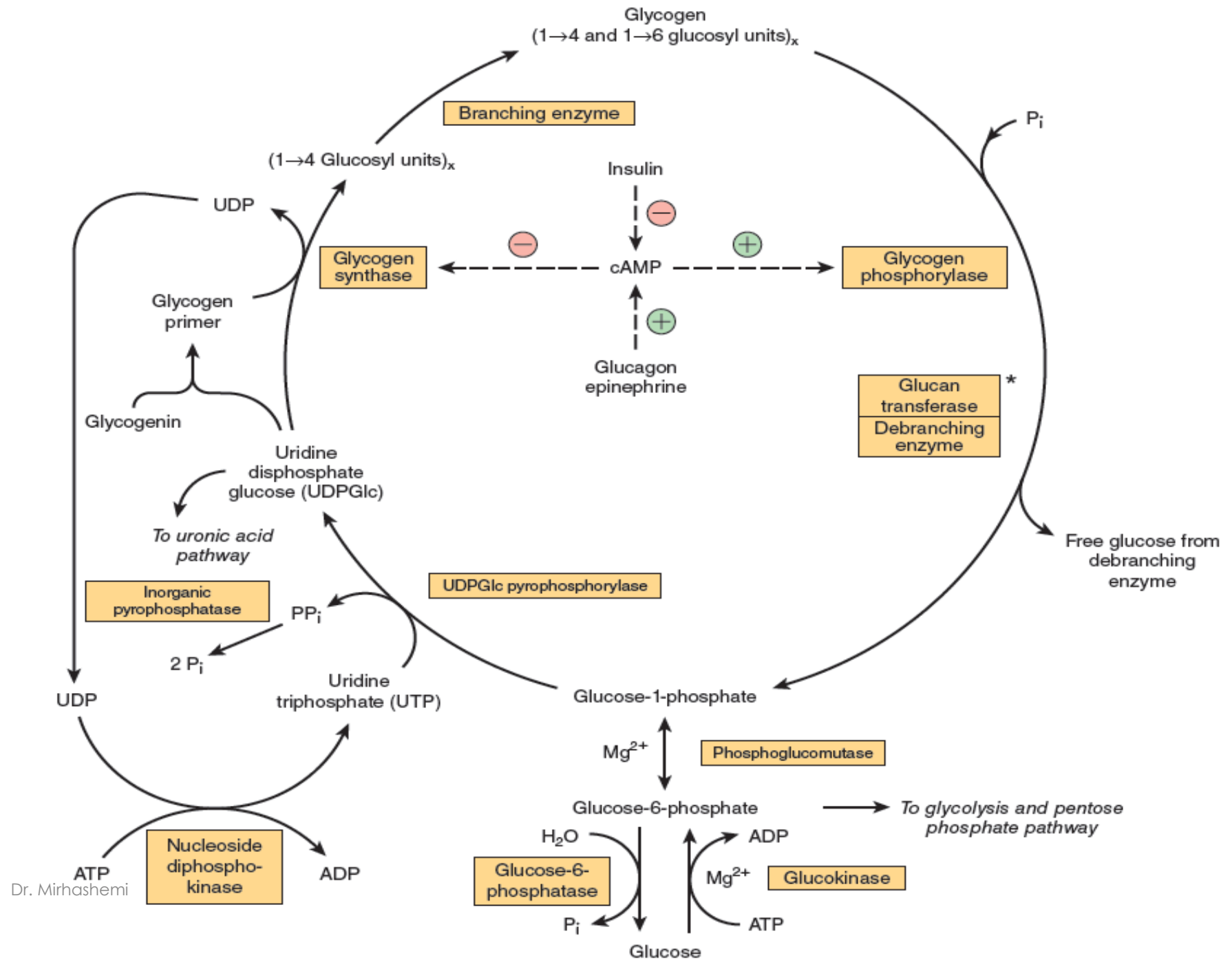
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Glycogen Breakdown and Synthesis Are Reciprocally Regulated

- The principal enzymes controlling glycogen metabolism: glycogen phosphorylase and glycogen synthase.
- Phosphorylation of glycogen phosphorylase increases its activity.
- phosphorylation of glycogen synthase reduces its activity.





Some types of Glycogen-storage diseases

Type	Defective enzyme	Organ affected	Glycogen in the affected organ
I Von Gierke	Glucose 6-phosphatase or transport system	Liver and kidney	Increased amount; normal structure.
II Pompe	α -1,4-Glucosidase (lysosomal)	All organs	Massive increase in amount; normal structure.
III Cori	Amylo-1,6-glucosidase (debranching enzyme)	Muscle and liver	Increased amount; short outer branches.
IV Andersen	Branching enzyme (α -1,4 \rightarrow α -1,6)	Liver and spleen	Normal amount; very long outer branches.
V McArdle	Phosphorylase	Muscle	Moderately increased amount; normal structure.
VI Hers	Phosphorylase	Liver	Increased amount.